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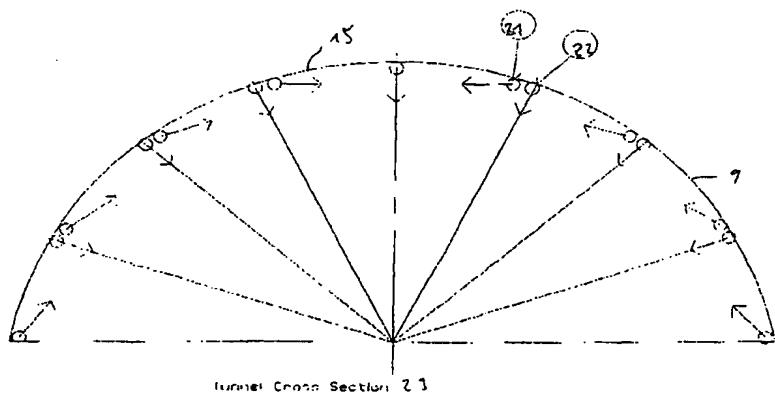
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[Fortsetzung auf der nächsten Seite]

(54) Title: GAMING DEVICE HAVING A BONUS SCHEME WITH MULTIPLE POTENTIAL AWARD SETS

(54) Bezeichnung: FIRE PROTECTION SYSTEM



21 Low Capacity Flat Cone Jet Nozzle
22 High Capacity Flat Cone Jet Nozzle

(57) Abstract: The present invention includes a gaming device and a method for operating the gaming device. The gaming device of the present invention includes a processor, a display device adapted to communicate with the processor, several sets displayed by a display device and at least one component associated with each set. Several selections are displayed by the display device and a prize is awarded to a player when a set is completed. A player completes a set and receives a prize for that set when the player picks selections and generates each component associated with a set.

(57) Zusammenfassung: The present twin water curtain fire control system is designed to prevent the fire from propagating into adjacent cars and areas in case of a fire incident. The system will encapsulate the fire between the twin water curtain sections in order to make the evaluation of people who may be trapped inside the tunnel possible. The present system is designed as a fire controlling system where the twin curtains will

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effectively stop the fire from propagation. The physics in this respect

TWIN WATER CURTAIN
FIRE CONTROL SYSTEM
PRINCIPLE DRAWING
TWIN WATER CURTAIN
NOZZLE CONFIGURATION

[Fortsetzung auf der nächsten Seite]



SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG,
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Zur Erklärung der Zweibuchstaben-Codes und der anderen
Abkürzungen wird auf die Erklärungen ("Guidance Notes on
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and the task is to create an effective water wall fire barrier. When hot smoke and air is reaching the fire curtain, the ambient temperature in this area will be significantly reduced as a function of rapid heat exchange/heat absorption. Water Curtain fire protection system, consisting of at least two water curtains, each curtain containing a plurality of nozzles, of which some of them are used for a high velocity water flow and the others are used for a low velocity water flow (flat cone nozzle) such that each curtain is forming a water barrier, whereby those curtains are located close together in a predetermined distance, for example in a distance between 0,5 metres and 20 metres.

Fire Protection System

The invention relates to a line protection system which is particular applicable for towers or similar buildings where fire fighting is very difficult. As learned from the recent disasters in several different tunnels (Mont Blanc tunnel, Tanorn tunnel, Kaprun tunnel, Saint Gotthard tunnel) existing fire protection systems are not yet good enough to provide for a sufficient level of safety for people inside of the tunnel in case of a fire accident.

It is object of the present invention to overcome the disadvantages of the fire protection systems which will be build in existing tunnels.

The object is solved by water curtain fire protection system according to claim 1. Further developments of this solution are described in the subclaims and the other part of this application in particular in the description and the figures.

The inventive twin water curtain fire control system is designed to prevent the fire from propagating into adjacent cars and areas in case of a fire incident. The system will encapsulate the fire between the (twin) water curtain sections in order to make the evaluation of people who may be trapped inside the tunnel possible.

The system is not only designed and calculated as a fire extinguishing system but will in a fire situation provide significant cooling of the ambient temperature. The system is designed also for use in other areas/building as in mining and indoor halls, road/rail and subway tunnels and for the protection of public station areas. The system can also be used in other areas where it is important to isolate the fire from propagating into adjacent areas and scrub the smoke.

Conventional known systems are normally protecting these types of areas with sprinkler/deluge systems. These systems require large amounts of water and are not really effective where a full three dimensional fire is propagating. Hidden spaces are a particular problem that is dependent upon a direct water flow to be extinguished. In places like tunnels, the scenario will always vary and will reduce the efficiency of the system.

The present system is designed as a fire controlling system where the (twin) curtains will effectively stop the fire from propagation. The physics in this respect and the task is to create an effective water wall fire barrier. When hot smoke and air is reaching the fire curtain, the ambient temperature in this area will be significantly reduced as a function of rapid heat exchange/heat absorption.

Between the (twin) fire curtains the pressure will be lower than outside of the curtains due to the constant flow of a combination of water jet and water fog. Inside this area the hot smoke gasses and air will be trapped and stopped from propagation into the other areas. The water curtain trap will reduce fresh oxygen

from entering the area on fire and over time the fire will suffocate and self extinguish.

Cooling of the ambient temperature and the isolation of the fire between the twin water curtain sections will allow the fire brigades to enter the tunnel for rescue and fire extinguishing.

The system is calculated with a high velocity water flow utilising a combination of special flat cone nozzles that will create forceful water barrier. The (twin) water curtains located close to each other and discharging simultaneously will withstand the dynamic pressure from the fire, cool down and scrub the air for soot and other particles from the combustion.

By locating two water curtain barriers within a short distance and make them discharge simultaneously, the dynamic pressure from the fire will be significantly reduced in two steps due to rapid heat exchange/absorption.

System Configuration (example)

The invention (twin) water curtain fire control system - as shown in Fig. 1 and Fig. 2 - consists of high performance flat cone deluge nozzles 22 in combination with flat cone water fog nozzles 21 that will create a homogeneous water spray with high velocity and medium to small sized water droplets. The nozzles are connected to a pipe system 9 designed to totally cover the full cross section area of the tunnel (voom) 23.

The nozzles are typically from 60 to 120 degrees spray angel with high velocity flow and an overall throw length of approximately 7 metres. The water flow per nozzle is dependent upon the cross section area and the cross section geometry. The nozzles will operate with good performance from 20 to 50 bar. The nozzles are designed with different spray angles for custom design to the area.

In a fire situation, e.g. 4 (twin) water curtains in a tunnel will be activated simultaneously which means a relatively low water flow compared conventional deluge-/sprinkler systems. Each water curtain is provided with dual automatic main valves 7 that will open upon signal from a fire detection or a manual remote controlled operating system. The 4 (twin) water curtains will make three sections each with a predetermined length that has to be in accordance with the type of tunnel to be protected.

This configuration increases the safety factor and will effectively stop the fire from propagating with two (twin) curtains on each side of the fire.

The system consists of a dual pump unit 3 connected to the main electrical power supply and an emergency power source. The pump unit is supplied with water from the water main 2 if necessary capacity is present or from a dedicated water reservoir 1 with capacity to feed the system for the predetermined duration.

The pipe system is under normal conditions all dry. The main line 6 is provided with a dual preaction valve unit 5 which is operated upon signal from the fire detection system or from a manual remote control system 14.

Each twin water curtain is provided with a dual automatic section valve unit 7 which is operated upon signal from the fire detection system or from a manual remote control system 14. The pumps 3 shall be connected to main electrical power and emergency power supply.

The valves and lines are operated and controlled by means of a PLC - Programmable Logic Control system 10,12. The PLC 10,12 system will operate and monitor the complete installation. The PLC is connected to a fire detection system 13 or to a manual remote control and operation system 14. All functions are programmed for the area to be protected. The system is a dual configuration with 100 % redundancy.

If the area is equipped with a fire detection system, the dual water curtain system 15 is to be configured in accordance with the fire detection system and will upon fire alarm signal activate the correct section valves for the water curtains 8,9 on each side of the place on fire.

The activation of the valves is executed by means of a PLC system. The system is a distributed control system with remotely located in and output PLC modules.

The in and output modules are linked together by means of a shielded 2 wire cable. The input and output modules are hard wired to the automatic section valves. The signal will be triggered by the fire detection system which will send an addressable instruction to the PLC's Central processing unit (CPU). The PLC is preprogrammed to always open three water curtain valves, the one close to the fire and the two adjacent valves on each side of the centre of the fire.

The system with all in and output modules and CPU is powered by 220V AC 10A. All units have built in 220/24V DC rectifier and batteries for 72 hours emergency power. In addition, a manual key board located in the control room allows for manual activation of the system by the operator in charge. All wiring is duplicated and made from fire resistant material.

Operation of the inventive system

When a fire is detected, automatically from the fire detection system or from other control and operation systems, the twin water curtain system 15 will be activated. The pump unit will start and the preaction valves will be opened to fully open position. Positive feed back signals are indicated on the PLC panel. When the pressure is reaching normal operating pressure, the section valves for the twin water curtains will open.

The PLC program will automatically open the valves programmed from the signal

coming from the section on fire. The system is a full coincidence program which always will active the sections and twin water curtains on each side of the place on fire.

The area is now in full operation allowing people who may be trapped within the section to evacuate into safe areas. The system shall be in operation till the fire brigades have full control and the fire is full extinguished and overhauled for any remaining hidden fires.

The system will run with full capacity and performance until it is deactivated. The deactivation can only be done manually.

System Components (examples)

1. Pump Unit

| | |
|---------------------------------------|--------------------------|
| Pump unit capacities | 1000 to 4000 ltr. min. |
| Operation Pressure | 20 to 40 bar |
| Power supply | 220/380/440/50-60 HZ |
| Control voltage | 24 V DC with battery |
| Control system | PLC with redundancy |
| Electrical motor start | Delta/Star - Soft start |
| Failure alarm output | Potential free contact |
| Pump start output signal | Potential free contact |
| Cabinet and Electrical Connections .. | IP 55 protection |
| Water supply to pump | Automatic solenoid valve |
| Pump/motor/control assembly | Carbon steel frame work |

2. Section Valve Cabinets

| | |
|--|-----------------|
| Automatic section valve material | Stainless Steel |
|--|-----------------|

| | |
|--------------------------------------|------------------|
| Automatic section valve dimension .. | ND 50 / ND 80 |
| Manual Service valve material | Stainless Steel |
| Manual Service valve dimension | ND 50 / ND 80 |
| Operation Pressure | 20 to 40 bar |
| Test Pressure | 60 bar |
| Electrical actuator | 24 V DC |
| Power Consumption | 4,5 A peak |
| Opening Time / Activation | 5 seconds |
| Cabinet | IP 67 protection |

3. Water Curtain Jet Spray Deluge Nozzles

| | |
|-------------------------------|------------------------------|
| Water Flow Capacity | 10 to 70 ltr./min. 20-40 bar |
| Spray pattern | Flat cone |
| Spray angle wide side | 60 to 120 degrees |
| Spray angle narrow side | 15 degrees |
| Throw length | 2 to 7,5 metres |
| Droplet sizes | 100/200/500 to 750 micron |
| Operation Pressure | 20 to 40 bar |
| Material | Stainless steel |
| Pressure test | 100 bar |

4. Programmable Logic Control

Full Redundancy

| | |
|----------------------------|-----------------------------|
| System Configuration | Distributed I/O |
| Communication | 2 wire - shielded |
| Input signals | Software / Siemens protocol |
| Output Channels | Relays 24 V DC/5 A |

| | |
|-----------------------------------|-----------------------------|
| CPU Central Processing Unit | 512 input/output processing |
| Alarm presentation | LCD Display / clear text |
| Software | Custom EEPROM |
| Power Supply | 220V AC/24V DC |
| Emergency batteries | 24 V /12 Ah |
| I/O cabinets | IP 55 protection |
| CPU / LCD cabinet | IP 22 protection |

Claims

1. Water Curtain fire protection system, consisting of at least two water curtain units (15), each curtain (18)containing a plurality of nozzles (21,22) , of which some of them are used for a high velocity water flow and/or the others are used for a low velocity water flow (flat cone nozzle) such that each curtain is forming a water barrier,
whereby those curtains are located close together in a predetermined distance, for example in a distance between 0,5 metres and 20 metres.
2. Water curtain fire protection system according to claim 1,
whereby the system is arranged in a tunnel.
3. Water curtain fire protection system according to one of the aforementioned claims whereby the plurality of twin water curtains are provided having a distance of at least 10metres to 20metres to each other.
4. Water curtain fire protection system as disclosed in the description and the figures of this application.

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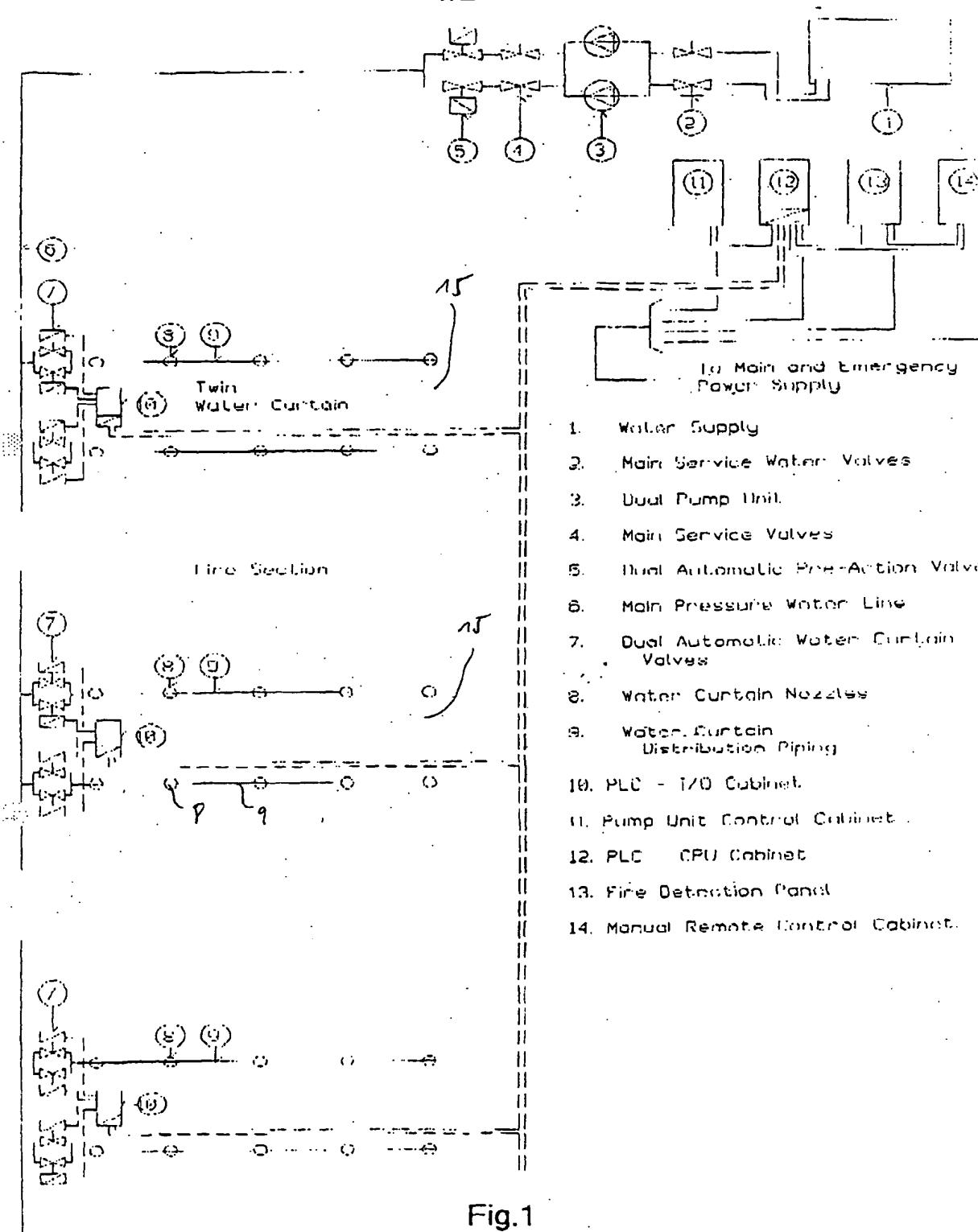
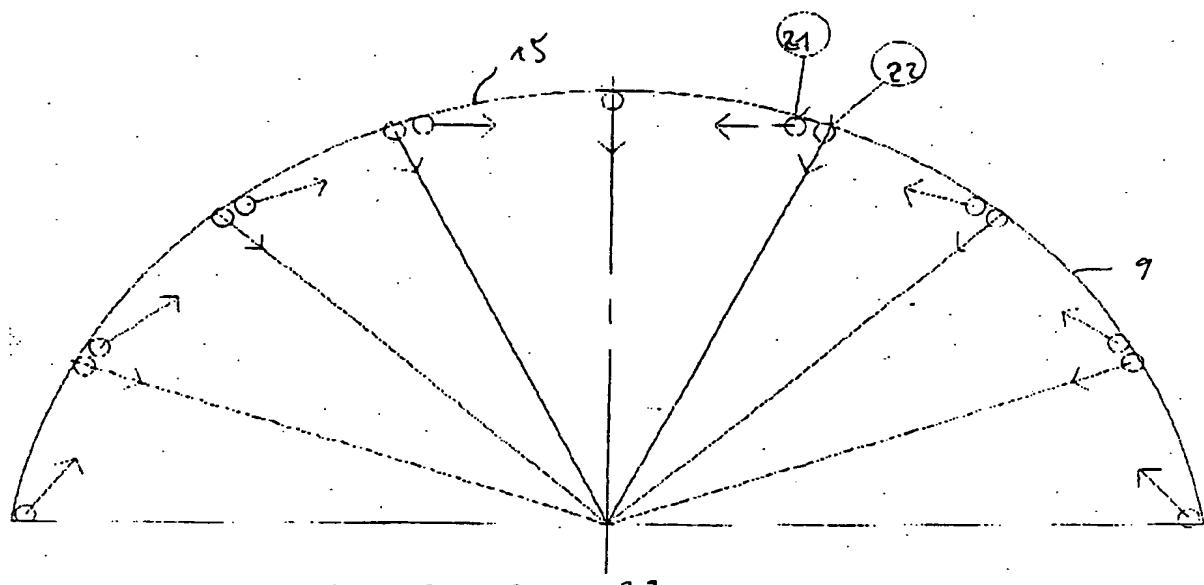


Fig.1

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Tunnel Cross Section 23

21. Low Capacity Flat Cone Jet Nozzle

22. High Capacity Flat Cone Jet Nozzle

Fig.2